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Poster
In order to construct improved maps of marine gravity anomalies, we have developed and tested retracking methods for determining sea surface slopes from radar altimeter return waveforms collected by the Jason-1 mission. The accuracy of marine gravity models derived from satellite altimetry depends mainly on two factors: first, the density of ground tracks covered by the mission, and second, the precision of range measurements obtained by retracking the return waveforms. The geodetic phase of the Jason-1 mission, which occurred over 406 days from May 2012 - June 2013, resulted in a 7-8 km track spacing at the equator almost globally, thus providing excellent coverage. Meanwhile, a double retracking method originally developed for ERS-1 and Geosat data was also applied to the Jason-1 return waveforms. In this approach, we perform a least-squares fit of the altimeter waveform power to a mathematical model with three unknown parameters: arrival time, rise time, and amplitude. After smoothing the rise time along track, the waveforms are then retracked again to recover arrival time and amplitude, thereby reducing the problem to the retrieval of two parameters. From the retrievals of arrival time we compute the noise in the range measurements over the 20 Hz sampling frequency of Jason-1. The noise levels are 1.6 times higher for 3-parameter retracking compared to 2-parameter retracking, implying that an increase in precision accompanies the double retracking approach. We also compare the noise levels in our 3-parameter retracked data to the values of standard deviation in range provided in the official GDR data product, which are processed using an MLE4 algorithm. The GDR noise levels are slightly lower for values of significant wave height (SWH) less than 3 m, but at high SWH the GDR noise levels are higher than the results from our 3-parameter retracker. In addition to estimating the noise by computing the deviations in range about a mean, we also perform a power spectral analysis on residual sea levels, which we obtain by subtracting the EGM 2008 mean sea surface model from our best estimates of sea surface height. We extracted segments of Jason-1 tracks from two regions in the Pacific: one is in the South Pacific where high SWH is typical, and another is in the Equatorial Pacific, which has characteristically low SWH. For both these areas, the power spectral density of the 3-parameter retracked data is higher in the 10-100 km wavelength band, compared to the 2-parameter retracked data. We believe that this corresponds to a decrease in noise levels in range due to double retracking.
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